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Abstract

THE U. S. PROGRAM FOR THE DEVELOPMENT OF ADVANCED CONCEPTS

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The United States Atomic Energy Commission is currently investigating a number of reactor concepts that offer significant long-range promise for advancing reactor technology. Each has potential utilization for one or more applications -- civilian central station plants, space power units, maritime propulsion units, military package power plants or others. To start the early exploration of these attractive areas of technology without becoming committed to the costly programs associated with urgent requirements and schedules, the Commission has undertaken the deliberate development, design, construction and operation of a number of relatively simple reactor experiments whose primary purpose is to demonstrate and establish the basic technical feasibility of the concepts involved and to provide an adequate basis for realistic evaluation of their ultimate potential. At present, the concepts under investigation include the Molten Salt Reactor Experiment, the Experimental Beryllium Oxide Reactor, the Ultra High Temperature Reactor Experiment, the Los Alamos Molten Plutonium Reactor Program, the Medium Power Reactor Experiment, and the Advanced High Temperature Gas Reactor, as well as others. A portion of the program is directed toward investigations of direct power conversion methods.

The Molten Salt Reactor Experiment (MSRE) is a 10 thermal megawatt experiment at Oak Ridge National Laboratory. It uses a mixture of molten fluoride salts as a combination fuel-coolant with graphite as the moderator. For thermal- or fast-neutron systems, this concept offers the potential of an economic, high efficiency system with high temperatures and specific power and low fuel cycle costs. The MSRE is scheduled to commence nuclear operation in 1965.

The Experimental Beryllium Oxide Reactor (EBOR) is being developed by the General Atomic Division of General Dynamics and is now under construction at the National Reactor Testing Station in Idaho. This 10-MW(th) experiment will explore and provide detailed data on the use of beryllium oxide as a high temperature reactor moderating material for long-term application. The EBOR is also scheduled for 1965 operation.

The Ultra High Temperature Reactor Experiment (UHTREX) at the Los Alamos Scientific Laboratory is a 3-MW(th) project to demonstrate the operation of a gas-cooled reactor up to temperatures of 2200-2400F (1220-1320C). This experiment is helium cooled and graphite moderated and will operate on unclad fuel to develop basic data that could be applicable to process heat or magnetohydrodynamic systems. The experiment is planned for 1965 operation.

The Los Alamos Molten Plutonium Program is generating basic data to evaluate the use of molten plutonium fuel in reactors. The Los Alamos Molten Plutonium Reactor Experiment (LAMPRE), 1-MW(th) experiment, has been in operation since 1961. A larger facility, the Fast Core Test Facility (FCTF), started construction in 1963, is a 20-MW(th) with provisions to accommodate a separate blanket region. The FCTF will be a flexible core test experiment and is scheduled to commence operation in 1967.

Development work is under way on the Medium Power Reactor Experiment, a potassium cooled, stainless steel reactor concept, whose objective is to demonstrate advanced technology applicable to a space power system of 100 to 300 kW(e) with specific weights on the order of 30 lb/kW(e) using conventional materials and reactor temperatures of about 1500F. Research and development is also being conducted on the Advanced High Temperature Gas Reactor, a fast-spectrum refractory-metal concept with potential for space power and other compact power system applications.